NEWSLETTER

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The Australian Society for Limnology is an association of over 400 people with professional or amateur interests related to Australian inland waters Since its inception in 1961 the Society has played an important role in fostering limnological work in this country. The ASL promotes liason between limnologists in academic, private and governmental institutions and has a vested interest in the conservation of aquatic and related resources. Annual conferences are held near centres of limnological interest, and the programme includes scientific sessions, field excursions and social activities.

The ASL produces a newsletter with notes on activities, articles of general interest, book reviews and conference announcements; a Bulletin of original scientific papers and occasional Special Publications. A further publication is the Directory of Australian Limnologists.

Membership applications are welcomed; five classes of subscribing membership are available:

Ordinary Members : $15.00
Student Members : $6.00
Life Members : $200.00
Institutional Members : Fees on Application
Sustaining Members : Fees on Application

Membership subscriptions cover the period from 1 July to 30 June and members receive all publications. Members may also choose to receive the Australian Journal of Marine and Freshwater Research, the Australian Journal of Zoology and/or the Australian Journal of Botany at reduced rates. The subscription period for each journal is the calendar year following the year in which the subscription is paid.

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Editorial

Following the Brisbane Congress I have had the somewhat dubious honour of becoming the newsletter editor. This is my first newsletter and it reflects some of the new approaches which I intend to introduce to this worthy publication. With your help I hope to make the newsletter both more informative and more stimulating.

Some of the innovations which appear in this issue are a "Comment" section which I hope to continue with a series of provocotive articles on issues in limnology or of concern to limnologists. I have also included a far more extensive listing of "Coming Events" than has been included in this newsletter previously.

Tomi Petr had written to Bob White suggesting the inclusion of a "Classified" section where limnologists could advertise items for sale or advertise for items needed. The sorts of items which could be listed could include books, journals, items of equipment and so on. I would be happy to publish any such advertisements sent in to me, and to run a "Classifieds" section as a regular feature if there is sufficient demand. In this issue I have commenced an "Announcements" section in which requests for material are listed, and conferences, new books and new organizations will all be announced. The success or failure of this section depends on the information which members send in to me, so get to it !

Also included for the first time in this issue is a section entitled "AGM HIGHLIGHTS". It is necessary that full minutes of both executive meetings an AGMs be published in the newsletter, and this will continue. However there are also two problems with this : one is that minutes are rather tiresome to read, and as a consequence I suspect that few members do read them, secondly minutes are often not published until long after the meeting although the decisions taken may be of immediate interest to members. As a possible solution to this problem I shall present a "Highlights" section after each meeting which will include my version of those decisions which I believe to be of wide interest to members.

Finally may I conclude with the universal newsletter editors plea :

PLEASE SEND MATERIAL !

Ian Campbell
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Comment

The following paper is reprinted from the February 1983 issue of the Newsletter of the North American Benthological Society with the permission of the author.

The P/B Dogma

Benthological investigators in the subject area of production biology have been much interested in the ratio of production rate to mean standing stock (or biomass), usually referred to now as the P/B ratio. Not long ago, it was called the "turnover ratio", because the number arrived at seemed intuitively to be the number of times the population "turns over" in a specified period of time. But for several reasons, P/B seems to be more appropriate (e.g., P.B is more specific; "turnover ratio" is sometimes confused with "turnover rate", "turnover time", etc.). The reasons for the interest shown in the P/B ratio are several, but the major one appears to be the finding that the cohort P/B ratio is fairly constant for most benthic invertebrates - something close to 5 (I'm more inclined recently to think 6 is a tad better), or at least in a range of, say 3 to 8.

(At this point, I want to insert this parenthetical emphasis: the P/B ratio must be stated in terms of a specified time period. The astute reader will note the term "cohort P/B" in the above paragraph, and the aspect of the constancy applies only to the time period of the cohort's duration, whatever that may be. Annual P/B, daily P/B, or other, may vary all over the place, albeit with good reasons. Writers and speakers should always be specific as to which they are reporting).

It is this aspect of constancy in the cohort P/B which brings me to the object of this communication. A scientific "constant" is an attractive idea, and there may be some good practical benefits. There are, of course, some good theoretical reasons why the cohort P/B should be around 5 or 6 (see below), but recently I have detected a tendency among some investigators to regard a constant cohort P/B as scientific doctrine (dogma) almost akin to e or Avogadro's number. That this is scientifically dangerous should be obvious. There are no constants in biology as in the physical sciences; in fact, it is the factors of variation and diversity that probably attracted most of us into our present endeavours.

I seem to be the one writing this entreaty about dogma because I am usually the one credited (or blamed) for it, apparently as the result of my emphasis on P/B ratios in my first publications. This makes me very sad. But by no means was I the first to

make an observation of constant P/B ratios; there were quite a number of such observations published in the literature long before I had anything to say about the subject (in fact, I think the Russians started it). Despite these excuses, I now stand before you all (via your editor's condonation) and admit my fault; this communication is an attempt to make amends.

First, the theoretical reasons why the cohort P/B should be fairly constant. The basic formula for estimating production in the instantaneous growth rate method is:

$$P = GB$$

where P = production, G = instantaneous growth, and B = mean biomass, all expressed for the same period. Jiggling the formula around, we find that:

$$P/B = G$$

Now if we consider the above for a cohort, the cohort P/B should equal cohort instantaneous growth rate (cohort G). Cohort G = the natural logarithm of the ratio max weight/min weight. If this max/min ratio is 10, cohort G = 2.3; if the max/min ratio is 100, cohort G = 4.6, if the max/min ratio is 1,000, cohort G = 6.9; and so on. And it follows, likewise for cohort P/B. Because the max/min ratio of most benthic invertebrates (I think) are usually on the order of several 100 to 1,000, the cohort G (and cohort P/B) is bound to be in the neighbourhood of 5 to 6 - you can't get very far from this range even if you tried.

Second, we do sometimes find variances from the range of 5-6. Why? Again, there are some good theoretical reasons. For example, if very high mortality occurs in the early life history stages of a species population, with subsequent lower mortality and high growth rate, causing a. low B relative to P, the cohort P/B ratio may be above cohort G; conversely, if a large proportion of a population lives to an old and larger mean individual size and stays there for a long time , causing a high B relative to P, the P/B ratio will be consequently lower than expected. P/B exactly equals G only if both growth and mortality are exactly exponential, as W.E. Ricker pointed out many years ago. Furthermore, it is entirely possible that the max/min ratio for a species may be lower or higher than several 100 to 1,000; for example, take the walleye (a fish, for you purist benthologists) which with very tiny eggs and potentially huge maximum size (in Minnesota, we measure them only between the eyes), the max/min ratio must be several 1,000.

Note the cohort G and P/B depend entirely on life history factors, not levels of productivity per se, water temperatures, photoperiod, etc., except insofar as these affect life history. Example: The several cohorts of a multivoltine species, in the same location , may have different cohort G and P/B because the winter generation

grows to a larger individual maximum size than does the summer generation (common in mayflies). Another example: What happens when part of a stream invertebrate population lives in an upstream reach, where the temperature is low and induces univoltinism, only to drift downstream to intermix with that part of the same species population living in higher temperatures that induce bivoltinism? (It boggles the mind). Yet another: Rotifers have essentially the same max and min size and all production goes into offspring; the cohort G may be zero, the cohort P/B - ? The list could go on forever.

So you see the cohort P/B is not Avogadro's number. Nor should it be dogma.

Finally (perhaps presumptuously),some advice to the young: Don't feel too proud of yourself just because you find the cohort P/B ratio to be 5 "as Waters 1977" says it should be; we both could be wrong. Besides, there's no fun in discovering the same thing that someone else already did. Don't feel crushed if you find a cohort P/B that differs markedly from 5; find out why; you may be on to something new and interesting. This could make you famous.

Variation and diversity are the only true "constants" in our field. After all, they are what make biology fun!

Thomas F. Waters

"You're being reincarnated as a mayfly, Mr Hoskins – have a nice day."

Jolly Award

Due to an administrative oversight, nominations for the Jolly Award have not yet been called for, for 1983. As a result the Society is now calling for nominations for the Jolly Award for 1983. The award may be presented to a person who, in the opinion of the award committee, has made an outstanding contribution to Australian Limnology. The Award commemorates Hilary Jolly a founding member of the Society.

Nominations must be made, and seconded, by members of the Society and should be forwarded, together with a brief supporting statement to the chairman of the committee : Dr P.S. Lake

Zoology Dept.
Monash University.
CLAYTON 3168
AUSTRALIA.

Nominations for the 1983 award should be submitted by September 30th, 1983.

AGM Highlights

A number of decisions have been made at the recent AGM and executive meetings which are probably of interest to most members :

Future Congresses - The next Annual Congress will be held at Mt. Gambier, South Australia, from the 18-20th May 1984. In addition, for the first time the venues of congresses have been determined more than one year in advance. The AGM voted to have the 1985 Congress in Perth, WA, so you have a year to save up. The Executive has since accepted a suggestion by the Western Australians to have the 1985 Congress in August rather than in March (due to availability of water!). A tentative suggestion for the 1986 Congress (the 25th) is Melbourne, since that was the birth place of the Society.

Life Members - A new form of membership was instituted at the AGM : life membership. It was introduced at the suggestion of Tim Berra who pointed out that life membership saved overseas members from all the hassles of foreign currency cheques each year.

Student Prize - The prize for the best paper presented by a student at the Griffith Congress was won by John Benzie from ANU for his paper : Complex population structures in the zooplankton. Congratulations John!

Student Travel Awards - Student travel awards were made to four students to assist them to attend the Griffith Congress. The recipients were : Stuart Bunn (Univ. WA), Jane Chambers (Univ. WA), Phil. Sinclair (Chisholm), and P. Hawkins (James Cook).

Secretary-Treasurer Position - The position of Secretary/Treasurer has been split into two positions. The new positions are Secretary and Treasurer/Membership Officer. The Secretary is Ros StClair and she will handle minutes and general correspondence while Margaret Hart is the Treasurer/Membership Officer and will handle subscriptions and queries on membership and publications. The addresses of both Margaret and Ros are inside the front cover of the newsletter.

News

THE SHIEL APPEAL

Russ Shiel is still appealing for any unwanted rotifers you may have cluttering up the lab. He is revising the Australian rotifer fauna for inclusion in an impending world revision of Koste's rotifer monograph. Any material can be sent to Dr. R. Shiel, Botany Dept., University of Adelaide.

THE TYLER APPEAL

Tyler announces a project to produce an interim handbook for the identification of Australian freshwater algae. The project is funded by the AWRC for three years initially. Most of the work will be carried out by Dr H. U. Ling in Hobart. Specimens (plankton samples) from anywhere in Australia are urgently needed, particularly samples from reservoirs. Plankton nets and instructions can be supplied if required. South Australia and Western Australia are areas of particular interest. As Tyler will be up a rather large creek in Brazil for the next couple of months please contact Mrs Rosemaree Wickham at Tyler's address. Your help would be greatly appreciated and may be rewarded in an unusual but acceptable currency at some future date.

For those who may not know, Tyler's address is : Tyler, Botany,Tasuni, HOBART 7000.

BOOKS

Our prolific members have recently presented, or are about to present,to the unwary limnological world three tomes which may be of interest to members :

The Purari - Tropical Environment of a High Rainfall River Basin. Edited by Tomi Petr. To be published in August 1983 by Dr. W. Junk, The Hague, as volume 51 in the Monographiae Biologicae series.

Chapters of interest to limnologists will include two on the limnology of the Purari sytem and one on aquatic pollution of the Purari system all by Tomi, another by A. Haines on fish fauna and ecology and one by B. Conn on aquatic and semi-aquatic plants in the Purari River system.

Life in Inland Waters, by Bill Williams. Published recently by Blackwells, 227 pages, rrp $15.95. This is Bill's first book this month. According to the publisher's blurb it describes the special features and diversity of Australian inland waters from the point of view of a biologist.
Our intrepid secretary has negotiated a deal with the publisher whereby you may obtain a ten percent discount for this book by simply sending in the order form which you should find as an insert in this newsletter together with a cheque for $13.36 directly to the publisher.

Light and Photosynthesis in Aquatic Ecosystems by John Kirk is expected to be published in early September by Cambridge University Press.

With any luck we may be able to bring you reviews of all three of the above in a future issue.

NATIONAL ESTATE REGISTER

Three sites nominated by the Society for the Register of the National Estate have recently been accepted as worthy of entry by the Australian Heritage Commission. The three are : the Barwon River (East Branch)
the Acheron River (Upper Catchment)
the Aberfeldy River (Upper Catchment).
Public notice of the Commission's intention to add these sites to the register is expected later this year. At least one of the sites may be under some threat since the MMBW is apparently keen to costruct a reservoir on the Aberfeldy River.

PEOPLE

There have been a number of movements of limnos in recent months :

Russ Shiel is back in Australia after completing a post-doc. at the University of Waterloo, Ontario, where he worked on the plankton communities of soft waters on the Canadian Shield comparing them with the communities of hard waters off the shield. He is now working with George Ganf at Adelaide of the

functional morphology of zooplankton feeding in Mt. Bold Reservoir. He is keen to swap ideas with anyone doing SEM work on freshwater organisms.

Jane Roberts is off to South Africa for a month.

Luisa Macmillan is leaving Chisholm Institute to take up a position at RMIT (in the Department of Architecture of all places!).

A large contingent of Australians will be attending the SIL Congress in Lyon in September. Those I have heard about include Russ Sheil and Bill Williams from Adelaide, Sam Lake and Ian Bayly from Monash, Tyler, Ian Campbell and Anne Graesser from Chisholm.

Max Finlayson has left CSIRO Centre for Irrigation Research (Griffith) to take up a position with the Office of the Supervising Scientist at Jabiru.

CSIRO JOURNALS

For the first time we are now offering you up to three CSIRO Journals at greatly reduced subscription rates. The two new journals are the Australian Journal of Zoology and the Australian Journal of Botany. Whether or not this service is continued depends on demand. The reduced rates do not apply to institutional members.

POOL CUE

It is apparently being alleged that one of our members souvenired a pool cue from Griffith University during the last Congress.As a consequence the Society is being billed the grand sum of $36. The allegation is a bit hard to sustain since our most notable "collector" wasn't even at the conference! But if, on arriving home you found that you seemed to have one too many pool cues in your suitcase/handbag or whatever could you please return it!

BENTHIC STATISTICS SEMINAR AT MONASH

Dr. Roger H. Green presented an informal seminar on 3rd of June at Monash University on the topic of extracting interpretable information from large, sparse data sets - a problem widely found in , but not peculiar to, limnology. Just to show us that it could all work , Roger had a set of real benthic data and had spent the months prior to his visit to Australia processing these numbers on a computer at the University of Singapore.

Roger covered the gamut of commonly encountered problems including the reduction of biological and environmental variables, the transformation of species abundances and methods of relating biological and environmental variables in an interpretable fashion. As you can imagine this took a couple of hours to explain, but it is all very well covered in his excellent book, Sampling design and statistical methods for environmental biologists (published by Wiley Interscience). The uninititated are urged to read this and then go and see their local, friendly statistician BEFORE they collect their data.

Perhaps one of the more interesting diversions in his analysis was a close look at the best method of transforming species abundance data. There have been two schools of thought : the log transformation school and the square root transformation school. Roger's data indicate that the best average transformation is somewhere between, but that for most purposes either is adequate.

All in all, Roger's talk was an excellent introduction to the imaginative, but impossibly complicated application of multivariate techniques to that feared monster of benthic ecology: the data matrix with lots of very rare species.

SALT LAKES IN ARID AUSTRALIA

Studies in hydrology, stratigraphy, and palaeoenvironment.

17-18 October, 1983

A workshop organized under the auspices of the SLEADS (Salt Lakes, Evaporites and Aeolian DepositS) program. No registration fee !

Persons wishing to present papers are requested to notify the organizers before 26 August 1983. To enable the volume of abstracts to be distributed at the meeting, the deadline for receipt of abstracts is 30 September, 1983.

There will be a one day excursion near Canberra to Lakes George and Bathurst on Sunday 16 October 1983. Interested persons should inform the organizers of their intended participation before 30 September, 1983.

Further information can be obtained from A.R. Chivas, Research School of Earth Sciences, ANU, PO Box 4, Canberra ACT 2601, or Patrick De Dekker (see Coming Events)

VICTORIAN STREAM SURVEY GROUP

This recently formed club in Victoria was accepted as an affiliated body of the ASL at the Brisbane annual general meeting in May. The Stream Survey Group comprises walkers interested in walking along rivers to provide some basic physical and biological data (e.g. width, substratum, algal and moss growth, amount of detritus) and the extent of modification by man.

The first series of walks was held on the Errinundra Plateau in East Gippsland. One emphasis was on quantifying the effects of forestry practices and this was not particularly successful. However, much useful information was gained on the nature of streams in the area, extent and inadequacy of forestry buffer zones and problems resulting from forestry, where further work could be carried out. The walkers were rewarded with a very close look at warm and cool temperate rainforest and some marvellous scenery, including in many cases, extensive waterfalls where creeks and rivers plunged down the escarpment. The slides taken on these walks provide useful information on the nature of Errinundra Plateau streams and on some forestry practices. The slides also show the beauty of the area and have been used in an attempt to persuade the Victorian Ministers for Conservation and Forestry that certain of the streams are in need of protection and that present forestry practices are detrimental.

The Errinundra walks were originally to be a "one-off" event. However, the results of this as a preliminary study, directing people to both "typical" streams and examples of various land use effects, were so good that it was felt that more such walks should be attempted. Consequently the Stream Survey Group was formed.

Future walks are being planned in the Dandenong Ranges - to assess the effect of bush fires; the Otway Ranges and the Roger River - Yalmy River area of East Gippsland.

Anyone who has an area or project to suggest for this group or who is interested in the group or any of the walks can contact Peter Lillywhite

LETTERS AJMFR

Dear Dr. Wild,

Re Financial Cuts to the Australian Journal of Marine & Freshwater Research

At the recent annual general meeting of the Australian Society for Limnology (ASL), members discussed what they felt was inadequate funding to the Australian Journal of Marine & Freshwater Research (AJMFR) and asked me to express to you their deep concern.

ASL members regard AJMFR as critically important for limnological research in Australia. Any further financial cuts to the already strained budget will inevitably lead to fewer or shorter papers being accepted, increase time delays between manuscript submission and publication and to an increases in the number of Australian papers published in overseas journals. All these effects would be detrimental to Australian limnological research in particular and to the Australian scientific community in general.

We therefore urge the CSIRO executive to reconsider the present excessively tight budgetary constraints on AJMFR, arguably the most rapidly expanding of the Australian journals. We believe serious consideration should be given to expanding the journals budget so that it can continue to serve a vital need for the limnological community in Australia.

Yours sincerely,

Dr. B. T. Hart
President

Dear Dr. Hart,

Thank you for your letter expressing your concern about the Australian Journal of Marine and Freshwater Research, which echoed a similar anxiety expressed recently by your colleagues in the Australian Marine Sciences Association.

My answer to you has to be the same as to them. All the Australian Journals of Scientific Research are under budgetary pressure at present, and resources are expected to be no easier next year. We are doing all we can to maintain their frequency and timeliness, but some constraints on size (which affects the costs of distribution as well as production) would seem to be inevitable into the foreseeable future. The Board of the journals will however look most sympathetically at the needs of your expanding field if it decides that some internal shifts of emphasis are justified in the publishing program.

Yours sincerely
J.P.Wild

INLAND AQUATIC RESEARCH IN WESTERN AUSTRALIA

This informal seminar-discussion group has met in March and July 1983. (No meeting was held in May as most of us were involved with A.M.S.A or A.N.Z.A.A.S. meetings.) These wine, cheese, coffee and seminar evenings have been well attended by between 25 and 35 people.

At the March meeting we heard short talks on:

1. Diatom community structures
   Jacob John (Western Australian Institute of Technology)
2. Battery culture of Cherax
   John Kowarsky (Western Australian Institute of Technology)
3. Macrophytes in waste water
   Rob Rippingale (Western Australian Institute of Technology)
4. Salt marsh invasion on the Canning River wetland reserve
   Luke Pen (Murdoch University)
5. Proposed studies on the ecology of Typha
   Judith Brown (Fisheries and Wildlife)

The July meeting heard talks on:

1. Estaurine research in the Waterways Commission
   Rob Atkins (Waterways)
2. Reducing phosphorus runoff from coastal plain catchments into the Peel-Harvey estuary.
   Peter Birch (Department of Conservation and Environment)
3. Reserve management in Benger Swamp
   Doug Watkins (Fisheries and Wildlife)
4. Wetfoots, waterfowl and waders
   Roger Jaensch (Royal Australasian Ornithological Union)

We have also set ourselves the task of putting together an inventory of current inland aquatic research in W.A. The first draft is now off the word processor and we hope to see it in print well before the end of the year.

Margaret Brock
Life Sciences
Murdoch University

Stuart Bunn
Zoology
University of W.A

7 July 1983

URBAN WATER COURSES: A PERSPECTIVE FOR THE FUTURE?

D.E.J. Garman

Urban watercourses have different values and roles in the States and Territories of Australia depending on the organisation responsible for their maintenance and for pollution control. The paper outlines some of the differences within Australia and attempts to define some of the difficulties which will arise in attempting to improve the quality of water in these systems. Engineering methods for control of quality are outlined, but with little control of social and biological factors, attempts at rehabilitation may be limited. Social, biological and ecological roles for urban watercourses will need to be defined to enable them to revert from their existing image as waste drains.

THE BIOLOGICAL RESOURCES OF URBAN CREEKS

Angela Arthington, School of Australian Environmental Studies,
Griffith University

Most Australian cities have developed along large rivers that are fed by a network of small creeks draining through suburban and urban areas. The plant and animal communities associated with urban creeks offer a variety of resources which can enrich human life. The address will briefly describe and illustrate the diversity of plants, invertebrates and vertebrates found in Brisbane's urban creeks and their immediate environs. Comparisons will be made with urban systems in other parts of Australia. Some of the effects on creek communities of creek hydrology, urban development (removal of catchment and riparian vegetation, flood mitigation works, freeway, bridge and airport construction, dredging for sand and gravel, and artificial storm water drainageworks), water pollution (sewerage, metals and pesticides) and the establishment of exotic semi-terrestrial and aquatic plants, and fish, will be discussed. From this basis the scientific, educational and recreational values of creek ecosystems will be outlined. Some specific management problems arising from the nature of hydrological regimes and from multiple uses of urban creeks are presented, and the need for planning procedures that give due recognition to the biological features of urban creek systems will be emphasised.

IS VICTORIAN URBAN WATER QUALITY A BOOJUM?

Ian C. Campbell, Water Studies Centre,
Chisholm Institute of Technology

With the inception of the Victorian Environment Protection Authority in 1970 the goal of clean urban streams was sought "with thimbles and care" and possibly even "forks and hope". More than ten years after the establishment of the Authority water quality in urban streams is still poor, and the goals, once so loudly proclaimed seem to have "softly and suddenly vanished away".

There are three reasons for the failure. A lack of adequate knowledge of urban systems. A failure to utilize the knowledge that is available on stream systems in general, and Australian streams in particular, to develop effective monitoring programmes. And, lastly, the development of institutional arrangements which tend to favour maintenance of the status quo rather than improving water quality in Victorian urban streams.

LIFE HISTORY OF NOTALINA FULVA (TRICHOPTERA: LEPTOCERIDAE)

Ros St. Clair, Department of Zoology,
Monash University.

A population of Notalina fulva in a small upland stream, the Acheron River, Victoria, is currently being sampled. This species is univoltine with emergence occurring over approximately two months in summer. Recruitment occurs prior to emergence of adults suggesting some form of quiescence of first instar (f-3) larvae for approximately nine months. This pattern was similar over the past two summers despite different environmental conditions. Observed changed in case material and shifts in habitat are related to stages in the life history.

Notes on the life history of Leptorussa darlingtoni from a temporary stream, the Lerderderg River, are included for comparison.

LIFE HISTORY OFKIRRARA PROCERA (HARKER, INSECTA: EPHEMEROPTERA) IN THE WELLINGTON RIVER, VICTORIA.

Ian C. Campbell and Melinda K. Holt, Water Studies Centre,
Chisholm Institute of Technology

The life history of Kirrara procera Harker in the Wellington River near Lake Licola, Victoria, was investigated from a series of samples of nymphs collected between November 1977 and January 1980. Measurements of the length of the mesonotum and wing pads were used to compile size frequency diagrams and the data were then further analysed using the technique suggested by Cassie (1954).

Adults appear to emerge mostly between November and April and nymphal recruitment occurs between February and April, indicating that the eggs hatch relatively quickly. Some of the nymphs complete their development within a year, but, some nymphs require up to two years. In the summers of 1977-78 and 1979-80 a wide size range of nymphs was present in the population, however, in the summer or 1978-79 this was apparently not the case. River flows were extremely low during the 1978-79 summer and it is possible that larger Kirrara nymphs, which normally live in rapid flowing water were unable to survive.

ON THE MACROINVERTEBRATE FAUNA OF STONES IN UPLAND STREAMS

P.S. Lake and T. Doeg, Department of Zoology,
Monash University.

The fauna of stones in the Acheron River was sampled from February 1979 to March 1980 using the techniques of Doeg and Lake (1981).

In comparison with published work, the stone fauna community of the Acheron River is rich (55 species) and taxonomically diverse. The winter fauna formed a distinctive group while the assemblages of each summer were dissimilar.

Collectors comprised the dominant trophic group, followed by scrapers. Collectors were constantly abundant; scrapers peaked in winter while shredders peaked in late summer coincident with the summer leaf fall.

The fauna was characterized by a high species turnover, a low abundance and low H' in summer but was constant with respect to other community parameters (S, S/A, D). This constancy is surprising as the community had been exposed to two potential forms of disturbance - spate and very low flow. The recolonization of stones is rapid. The nature of the community is speculated upon.

UTILIZATION OF LEAF LITTER BY MACROINVERTEBRATES IN JARRAH FOREST STREAMS, WESTERN AUSTRALIA.

Stuart Bunn, Department of Zoology,
University of Western Australia.

The generalized model of stream community function, developed for North American systems , emphasizes the importance of leaf litter as a major energy source. These streams flow through deciduous forests and, following an autumn pulse in leaf litter input, breakdown of the leaves by invertebrates occurs over winter. In this respect, streams in the northern jarrah forest, W.A., differ from North American streams in the timing and nature of the leaf litter input. After a summer pulse in leaf litter, we would predict breakdown to occur over late summer/autumn.

Leaf bag experiments showed that stream invertebrates did not contribute to leaf

breakdown over late summer/autumn. Two possible factors were seen as being responsible: (1) the low proportion of coarse-particle detritivores (shredders) at this time; and/or (2) the poor quality of jarrah leaves as a food source. Subsequent experimentation indicated that the slow rate of leaf breakdown is a function of leaf quality rather than seasonality in community structure. Preliminary data on the possible inhibitory effect of high levels of polyphenols will also be presented and the pattern of litter degradation in jarrah forest streams proposed.

COMMUNITY DYNAMICS OF THE POOL FAUNA IN AN INTERMITTENT STREAM

Ross E.W. Smith, Department of Zoology,
James Cook University of North Queensland.

The dynamics of the benthic macroinvertebrate communities in four pools of an intermitent stream were studied. Cluster analysis of community change in all the pools showed that major changes in the communities were caused by stream flow, and the drying out of the pools (for pools of >4 months duration). Specialized fauna were associated with both these stages during the existence of the pools.

Principle component analysis confirmed that in the longer-lived pools the effect of drying caused the greatest amount of variation in the observed abundance of the macro-invertebrate species, while seasonal and successional changes were shown to be of secondary importance. However, in a pool which dried up in less than four months, the effect of drying was only the third greatest source of variation, successional and seasonal changes being more important.

The introduction of a fish species, Leiopotherapon unicolour (Gunther), caused major changes in the macro-invertebrate community of one pool, and these changes were more important than the effect of drying of the pool.

FAUNA OF THE ANNAN RIVER, FAR NORTH QUEENSLAND

R.G. Pearson, Department of Zoology,
James Cook University of North Queensland.

The vertebrate and macro-invertebrate fauna of the Annan River and associated streams was surveyed in May and November 1982. As with many north Queensland streams, the Annan rises in rainforest-clad hills. It then crosses a drier plain and is punctuated by a major waterfall.

The faunal assemblages at a number of locations are briefly described. Community parameters are considered, particularly with respect to geographical location, zonation, season and stream discharge, barriers to dispersal, and past mining

activities.

SOME CONCEPTS IN POLLUTION ECOLOGY

Des Connell, School of Australian Environmental Studies,
Griffith University.

A large body of literature exists on pollution ecology but few attempts have been made to identify the principal relationships involved. Pollutants, according to their effect on ecosystems can be classified as: organic matter, plant nutrients, toxic substances, suspended solids, energy and pathogenic organisms. Organic matter and plant nutrient interrelationships, as pollutants, can be seen using plots of primary productivity versus respiration.

This allows the relationship between saprobic and trophic classed to be seen. However, the effects of these pollutants on community structure and other biological variables show characteristic and different patterns.

The broad ecological effects of toxic pollutants have been investigated by various investigators using simulation modelling. By combining these results with field investigations some generalisations are possible. Ecological effects of suspended solids have several features in common with those due to toxicants. Pathogenic organisms have received particular attention in relation to human health but few results are available on natural ecosystems.

The major form of energy pollution is due to thermal discharges from electricity generating stations. Although the information is limited, in broad terms, ecological effects can be expected to be related to the existing natural thermal regime.

BENTHIC MACROINVERTEBRATES IN THE YARRA RIVER, VICTORIA

Luisa MacMillan, Water Studies Centre,
Chisholm Institute of Technology.

It is frequently assumed that the condition of benthic macro-invertebrate communities in streams closely reflects water quality and that routine water quality monitoring gives an adequate picture of the health of a river. A two year study of the benthic macroinvertebrates in the Yarra and its tributaries shows this is not the case - monitoring of the benthic invertebrates highlighted a number of "problem" areas which were not obvious from water quality data.

The study also investigated a number of ways of dealing with, and interpreting biotic information, including the use of diversity indices, similarity indices and clustering techniques. Problems with each of these approaches were identified.

THE IMPACT OF EROSION SEDIMENT ON STREAM-BED STRUCTURE AND BENTHIC INVERTEBRATES IN THE THOMSON RIVER, VICTORIA

Davey, G.W., Blyth, J.D., and Brooks, P.,
National Museum of Victoria.

Modified versions of a Surber sampler and Coleman-Hynes baskets, plus a method for examining vertical stratification within the bed, were used to take quantitive samples of bed material and benthic fauna from sites upstream and downstream of the Thomson Dam construction area. Particles moving on the stream bed were almost all < 2 mm in diameter. Up to twice as much of this fine material was deposited in riffles downstream of the construction area than in those upstream throughout the two years of the study. Little obvious blanketing of the sampled riffles occurred. At sites downstream of the construction area silt and clay (< 0.063 mm) were the dominant particles, while at control sites sand (1-2 mm) was most abundant. These two size classes dominated all levels in the artifical substrata to 60 cm deep. Means per sample for invertebrate biomass, numbers of individuals, and numbers of taxa were approximatley halved one km below the construction area, for both Surber and basket samples, as were total taxa per station. These factors all showed recovery with distance downstream, but were still well under values at control sites 33 km from the dam area. Most taxa were collected over a wide range of substratum depths to 60 cm, throughout the study.

ZINC IN THE MOLONGO RIVER - 20 YEARS REVISITED

Richard H. Norris, School of Applied Science,
Canberra College of Advanced Education.

The Molongo River in 1963 was the first metal polluted river in Australia to be well studied biologically. Approximately 3 million dollars have been spent since 1975 to stabilize the mine dumps at Captain's Flat. The dumps were thought to be the major pollution source to the river. The National Capital Development Commission sponsored the study described here to repeat the biological work conducted in 1963 in order to assess the effectiveness of the remedial works.

There was little change in the low flow concentration of zinc and probably those of sulfate, bicarbonate and pH, when compared with determinations made prior to the conduct of the remedial works. Mine seepage is still the source of these effluents. The distribution and abundance of the invertebrate fauna indicated by the present study was not significantly different from that provided in the 1963 study. Studies to

define the criteria enabling the abatement of contamination by mine effluents have not been successful. The abundance and richness of benthic fauna in Lake Burley Griffin, which is on the Molongo River, are low but reasons for this remain unclear.

INFORMATION GATHERING AND ANALYSIS IN WATER QUALITY ASSESSMENT STUDIES

C.J. Milligan, Oceanics Australia Ltd.

From experiences gained in a survey of five small catchments in south-east Queensland, several factors emerged as being pertinant in determining an appropriate set of methods in assessing water quality.

These are discussed in some detail in which climatic patterns, stream hydrology, substrate, physico-chemistry of water, point source inputs, broad land usage influences benthic and nektonic faunal characteristics are examined. Methods of manipulating and analysing data of the above aspects is also examined with the conclusion that although complex matching statistics may be mathematically elegant, the information lost in the analysis can be critical in making biological sense of the data. Simple methods usually are sufficient to detail inter-site and intercatchment.

LATROBE RIVER STUDY - I: HEATED WATER, PROBLEMS AND APPROACHES

Richard H. Norris, School of Applied Science,
Canberra College of Advanced Education.

The LaTrobe River flows entirely through agricultural , urban and industrial areas. The major industrial activity is the generation of electricity from brown coal by the State Electricity Commission of Victoria. As a consequence heated water and saline effluents are released to the river. The aims of the study were; to describe the distribution of the microinvertebrates of the lower reach of the LaTrobe River; to determine the effects on the fauna of lower temperatures since more restrictive licensing regulations were introduced in 1976; and to assess the capacity of the fauna to withstand further variation in water quality.

The study was designed to also account for urban and sewage inflows and the effects of a dam and a weir. 30 samples were collected every 2 months for 2 years from 10 sites on the LaTrobe River. 15 from the main channel and 15 from within 1 m of the bank. Samples for chemical measurements were collected concurrently. Quantitative sampling such as this has enabled the conduct of comprehensive statistical analysis including multivariate methods such as classification procedures and stepwise discriminant analysis. This approach is proving to be very useful for ecological

studies.

LATROBE RIVER STUDIES -II: RESULTS

R. Marchant and P. Mitchell, National Museum of Victoria.

Numerical classification of the faunal data with two similarity indices indicated that the two least disturbed sites with a rich fauna were clearly distinct from the more depauperate downstream sites; these latter sites could be divided into two groups (main channel samples) or four groups (bank samples). In both habitats eight groups of common (>0.05% of total numbers) taxa were evident: in each habitat one or two of the groups consisted of taxa abundant at all sites (resistant taxa), one or two of taxa common at the disturbed sites only and two of taxa that were most abundant at the two undisturbed sites (sensitive taxa). Multiple discriminant analysis using 17 chemical factors indicated that high values for conductivity distinguished the lowest four sites with the most depauperate fauna; the effect of this factor on the fauna was apparently indirect. The analysis also indicated that a decrease in suspended solids at two sites on an impounded section and an increase in nutrients at a site immediately downstream of the input of treated sewage were associated with changes in fauna. The release of heated water (<25°C) from a power station at one of the sites on the impounded section had little effect on the fauna.

TRANSPORT OF POLLUTANTS BY SUSPENDED SEDIMENTS

Phil Sinclair, M. App. Sc. (candidate), Water Studies Centre,
Chisholm Institute of Technology.

The collection and the chemical and biological investigation of suspended sediments from the Yarra River (Melbourne) are described. Emphasis is given to the importance of event-oriented sampling; in particular spates are examined. Chemical and biological analysis are discussed that provide information on the potential biological availability of phosphorus and trace metals associated with the suspended sediment; bearing in mind the sites where the material is deposited.

THE TRACE METAL COMPLEXING CAPACITY OF MAGELA CREEK WATERS

M.J. Jones, Water Studies Centre,
Chisholm Institute of Technology.

Two methods have been developed to measure the copper complexing capacity in natural waters; an amperometric method using anodic stripping voltammetry (ASV) and a potentiometric method using an ion selective electrode. Comparison of the two

methods using Island billabong water, revealed some marked differences in the complexing capacity and conditional stability constants determined by each; the ASV method gave smaller complexing capacity and larger stability constants. Reasons for the differences will be advanced.

The copper complexing capacities measured in filtered water from four billabongs were very similar. Experiments using ultrafilteration and u.v. oxidation, showed that most of the complexation was due to organic matter, although the relative contribution of colloidal and "dissolved" organics varied quite markedly between the billabongs studied.

ABUNDANCE OF AUSTRALIAN BASS, (MACQUARIA NOVEMACULEATA), IN THE HAWKESBURY RIVER SYSTEM, AND THE EFFECT OF REDUCED FLOODING DUE TO MULTIPLE STREAM IMPOUNDMENT.

J.H. Harris, School of Zoology,
University of New South Wales.

Coastal drainages of south-eastern Australia have frequently been impounded for domestic, irrigation, industrial and other purposes. The Hawkesbury River near Sydney is the most heavily regulated system in the region, and downstream flooding has declined.

Little is known of the biology of the freshwater fishes of this region, but about 28 species have migratory life cycles, including Australian bass, Macquaria novemaculeata. This species uses flooding as an environmental cue stimulating breeding, and a recent study of the age structure of Hawkesbury bass populations has shown that flooding is a major factor determining cohort success. Relative year-class abundance is positively correlated to peak river height during the spawning season.

Although the results of the study show that large-scale storage and diversion of flow have affected bass populations, they also indicate storage management strategies that may reduce the problem.

THE IMPACT OF CHANGES PRODUCED BY RECREATION ON FRESH WATER HABITATS

M.J. Liddle, Griffith University.

As suggested by Liddle and Scorgie (1980)*, it is convenient to consider the ecological changes in two groups: (1) The direct effects on aquatic biota, (2) the direct effects on terrestrial biota adjacent to lakes and streams.

The effects on macrophyte are usually breakage and uprooting due to turbulence

created by boating or trampling by fishermen. Fishing has, of course, a direct effect on fish populations, as does the disposal of alien fish by aquarium-keepers. Pollutants may come directly from swimmers, boats or passengers in boats.

The effects on shore vegetation are the results of trampling, the use of vehicles, or the more drastic consequences of clearing woodlands and seeding with grasses or laying of concrete. Pollution may also occur here as sewage or litter, or oil and petrol spillage. These will have an indirect effect on the quality of run-off waters.

The ability of the different kinds of biota of water bodies to remain unchanged in the face of these impacts is relatively unknown. In general, those situations which experience natural changes akin to those produced by recreation activities may be expected to be less vulnerable.

* Liddle, M.J. and Scorgie, H.R.A., (1980). The effects of recreation on fresh water plants and animals: a review. Biological Conservation, 17, 183-206.

WETLANDS AND NUTRIENTS IN THE HARVEY CATCHMENT, WESTERN AUSTRALIA

Jane M. Chambers, Department of Botany,
University of Western Australia

Wetlands in the catchment of the Harvey River, which carries a heavy phosphorus load into the eutrophic Harvey Estuary, are being studied because little is known about their hydrology, ecology and nutrient status, and because of the possibility that such wetlands, or plants from them, might be used in "biological filters" to remove phosphorus from water entering the Harvey River. Three wetlands were studied, with a similar bathymetry and vegetation; a lake basin surrounded by a shallow floodplain covered in a swamp woodland association. The areas of fringing vegetation differed, one wetland being in a reserve, the others in farmland.

Lake volumes were closely related to rainfall and evaporation, with peaks in winter during high rainfall and groundwater input. There was no surface inflow and little surface outflow, but salinities were low. Phosphorus content of the lake water was inversely proportional to the amount of fringing vegetation, the swamps having maximum phosphorus concentrations of 14, 0.4 and 0.1 mg l^{-1}. The waters were heavily stained, and devoid of phytoplankton. The fringing vegetation represented a relatively large store of phosphorus.

The sedge common to these wetlands, Lepidosperma longitudinale, was found to have a phosphorus content of up to 8 mg g^{-1} and a productivity of up to 5.0 g dry wt m^{-2} d^{-1}.

THE USE OF COPPER AS AN ALGICIDE IN A SMALL TROPICAL IMPOUNDMENT

P.R. Hawkins, Botany Department,
James Cook University of North Queensland.

Copper sulphate treatment was applied to Solomon Dam, Palm Island in December 1982, when the reservoir was strongly stratified. The effects upon the total phytoplankton and photobacterial concentrations, primary productivity and the relative abundance of the major algal genera, were monitored over the succeeding four weeks. Changes in major nutrient concentrations were also monitored.

Analysis of total and filterable copper showed that copper concentrations in the epilimnion remained high for three weeks following application. A large proportion of the dissolved copper was associated with a complex having a molecular weight greater than 50,000 daltons.

The reduction in total phytoplankton density after the copper treatment was accompanied by the development of a different algal community dominated by the two green algal genera Chlorella and Scenedesmus, both of which showed morphological abnormalities. Four weeks after treatment, the phytoplankton community was dominated by Coelastrum. The population of photosynthetic bacteria in the hypolimnion was largely unaffected by the copper treatment.

RECENT ADVANCES IN THE BIOCHEMISTRY OF TRACE METALS

Barry T. Hart, Water Studies Centre,
Chisholm Institute of Technology.

This address will cover some recent advances in trace metal chemistry in two main areas - metal speciation (ie., physico-chemical forms of the metal) in natural waters and the interaction of metals with cells.

In the area of trace metal speciation in natural waters, the increasingly important role of natural organics and of colloidal and particulate surfaces in determining the speciation will be emphasised.

It is now well established that the toxicity of trace metals is closely linked with the speciation. However, the mechanisms by which organisms may detoxify or bioaccumulate trace metals is much less will understood. Current knowledge in this area will be covered.

DESTRATIFICATION OF LAKE BULLEN MERRI

Frank L. Burns, Consulting Engineer,
Glen Waverley, Victoria

Lake Bullen Merri is a 66 m deep, slightly saline (11%) maar lake of volcanic origin, near Camperdown in Western Victoria. It has an area of 490 ha, and volume of 200,000 ml.

Besides stratifying strongly with rapid oxygen depletion below 15 m depth each summer, there have been dense summer blooms of the algae Nodularia which interfered with the recreational use of the lake is considered to have contributed to oxygen depletion and fish kills.

The paper will describe the low cost diffused air destratification operation carried out through the 1982-3 summer by the Victorian Fisheries and Wildlife Division to successfully overcome these problems.

Twin 12 m long aerators supplied by a 100 L/s diesel compressor were operated intermittently from December to April at a fuel cost of about $200 per week to maintain good mixing and 50% saturation dissolved oxygen to 20 m depth. This completely eliminated the algae Nodularia which had developed to bloom proportions over the whole lake before aeration, and for the rest of the summer the lake was clear with excellent fishing conditions.

ASPECTS OF THE BIOLOGY OF MYTILOCYPRIS HENRICAE(CHAPMAN) (CRUSTACEA, OSTRACODA) IN LAKE BATHURST, N.S.W.

Koen Martens, Department of Zoology,
Australian National University.

The relative abundance of the life stages of this species were recorded monthly over 1.5 year period and at weekly intervals over 10 months. Physical and chemical properties of the water were studied. Sex ratio and percentage of ovigerous females were calculated.

Laboratory experiments on the lifespan and valve size of the different larval stages were conducted at 10, 15, 20 and 25 degrees Celcius ($S = 8.000 \times 10^{-3}$) and at salinities 4.000×10^{-3}, 8.000×10^{-3} and 16.000×10^{-3} (20 degrees Celsius) and showed that animals at 10 degrees take almost twice as long to complete the life cycle as animals at 20 degrees. Experiments at 25 degrees showed high mortalities, mainly in the first 4 instars. The three salinities appeared to be suitable for completion of the life cycle.

Salinity tolerance of adults was studied both through direct transfer and acclimation experiments. Upper LD50 values from direct transfer experiments are temperature sensitive, ranging from about 27.000×10^{-3} at 25 degrees to 33.00×10^{-3} at 10 degrees. Lower LD50 values are situated around 0.300×10^{-3}. Survival and moulting

rates of stages 7 and 8 was monitored in six different salinities, of which only 8.000 x 10^{-3}, 15.000 x 10^{-3} and 20.000 x 10^{-3} appear to offer suitable moulting conditions.

ASPECTS OF THE BIOGEOGRAPHY OF WATERFLEAS (CRUSTACEA: CLADOCERA) IN NORTHERN AUSTRALIA

B.V. Timms, Sciences Department,
Avondale C.A.E.

To date 67 species have been identified from northwest Western Australia and Northern Territory; far north Queensland will be explored this winter. The dominant species are Chydorus eurynotus, Ceriodaphnia cornuta and Ephemeroporus barroisi. Eight species are recorded from Australia for the first time, there are four new species and a species rediscovered. Compared with the remainder of Australia there are more circumtropical and fewer endemic species.

Within the study area few species are distributed in the southern parts; these are all common widespread species, or species otherwise found in southern Australia. Most species are restricted to the northern areas; some are found elsewhere in Australia, so must find the dry interior unsuitable, while others - the circumtropical species - are restricted to the north. All the new records and species are from the northern areas. Species richness increases northwards and eastwards to reach a maximum at Kakadu, probably due to increasing structural complexity and degree of habitat permanence along these axes.

COMPLEX POPULATION STRUCTURES IN THE ZOOPLANKTON

John A.H. Benzie, Department of Population Biology,
Research School of Biological Sciences,
The Australian National University.

Many groups of freshwater zooplankton have a range of mating systems and often show a large degree of inbreeding. This, combined with their fragmented allopatric distribution, gives rise to genetically complex population structures. This, in turn, produces difficult systematic and ecological problems for zooplankton researchers.

The population structure of Daphnia in Australia is described. Methodologies which have highlighted, and to some degree provided solutions for, the difficult systematic problems are discussed. The consequences for ecological studies are then considered.

Coming Events

21 to 22 September 1983

Estuarine and Brackish-water Sciences Association Meeting

Venue : Heriot-Watt University, Edinburgh.

Theme : The structure and function of inshore and brackish-water communities.

Details : Dr M. Wilkinson, Department of Brewing and Biology, Heriot-Watt University, Chambers Street, Edinburgh. (Eds query : is this where J Benzie gained his undergraduate qualifications ?)

17 to 18 October 1983

Salt Lakes in Arid Australia

Venue : Australian National University, Canberra.

Details : P. De Decker, Research School of Pacific Studies, ANU, PO Box 4, Canberra, ACT 2600.

18 to 20 October 1983

International Symposium on Lake and Reservoir Management

Venue : Knoxville, Tennessee

Details : Wayne Poppe, Tennessee Valley Authority, 248 401 Bldg., Chattanooga, Tennessee 37401.

3 November 1983

Scottish Freshwater Group Meeting

Venue : University of Stirling

Details from : Dr P. Maitland, ITE, 78 Craighall Road, Edinburgh.

7 to 10 November 1983

Tenth Annual Aquatic Toxicity Workshop.

Venue : Halifax, Nova Scotia.

Details : R. Addison, Marine Ecology Laboratory, Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada B2Y 4A2.

21 to 22 November 1983

Water Quality Management Symposium

Venue : Chisholm Institute, Melbourne.

Theme : The role of particulate matter in the transport and fate of pollutants

Details : Mr T. Davies, Water Studies Centre, Chisholm Institute of Technology, East Caulfield 3145, Australia.

23 to 25 November 1983

AWRC Workshop on Surface Water Resources Data

Venue : Canberra

Details : Ian Bergman, AWRC, PO Box 5, Canberra ACT 2600

21 to 22 December 1983

Winter and Annual General Meeting, British Ecological Society.

Venue : University of Leicester

Sessions proposed include : Feeding and foraging by aquatic animals, Tropical Limnology, Ecophysiology of aquatic organisms, River community structure.

6 to 10 February 1984

AWWA Fifth Summer School

Venue : Canberra CAE

Theme : Methods of water management : 1984 and beyond.

Details : School of Applied Science, Canberra CAE, PO Box 1 , Belconnen ACT 2616

14 to 18 May 1984

54th ANZAAS Congress.

Venue : Canberra

Details : ANZAAS, Box 873 GPO, Sydney.

13 to 17 August 1984

Fourth International Conference on Mediterranean Ecosystems.

Venue : University of Western Australia.

Theme : Resilience in Mediterranean Ecostems.

Details : MEDECOS, Botany Dept, University of Western Australia, Nedlands, W.A. 6009.

20 to 26 August 1984

17th International Congress of Entomology

Venue : Hamburg

Details from Dr Thomas Tischler, Zoologisches Institut, Universitat Kiel, Olshausenstr. 40/60 D-2300 Kiel 1, Federal Republic of Germany.

28 to 29 August 1984

Ecological Society of Australia Meeting.

Venue : Sydney

Theme : Are Australian Ecosystems Different ?

Details : Dr Mark Westoby, Biology Department, Macquarie University, North Ryde, NSW 2113.

Bibliography

The following is the commencement of a limnology bibliography for Australia or by Australian workers. For inclusion of references, please forward, titles, abstracts, reprints or citations to R. TAIT, C/- ESSO AUSTRALIA LTD., COAL & SYNTHETIC FUELS DEPARTMENT, P.O. BOX 4047, SYDNEY, 2001, N.S.W. To make this complete and worthwhile, everybody in ASL should contribute.

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